

STUDY GUIDE & SUPPLEMENTAL INFORMATION FOR:

BubbleMania: Science, Art & Comedy!

Created by Casey Carle

Nationally recognized Comic Bubble-ologist and Award Winning Soap Bubble Artist

A Reproducible Study Guide for Teachers, Educators and Parents.

This study guide was co-developed by staff at *Discovery Theater*, The Smithsonian Institute, Washington, D.C. It is designed to help you and your students prepare for, enjoy and discuss **BubbleMania!**. This guide contains background information, discussion questions and classroom activities that can be adapted to grades K-6.

Please Note: On the day of the show, the performer will be supplying the school with an additional "Secret Bubble Formula Page" that is intended to be distributed to the teachers or scanned to the school's website page. This single page hand-out is a more direct reinforcement of the lessons presented during the live assembly and offers additional hints and helpful advice to assist students (and teachers) in their personal exploration of the fascinating world of bubble science and art.

www.BubbleMania.com is another helpful destination for assistance with bubble exploration. You will find: stunning photos to jump start the imagination, videos to amaze and inspire (including a step-by-step bubble art workshop), science fair project suggestions, Frequently Asked Questions, plus an updated lists of books and websites related to bubbling.

SUBJECTS COVERED IN THIS STUDY GUIDE

- * The Science of Bubble-ology
- * Bubble creations as Art Form
- * Homemade bubble solutions
- * Pre and Post show activities
- * Vocabulary of Bubble-ology
- * A Bubibliography (books & web sites)

WHO IS CASEY CARLE?

One of 10 children, Casey grew up in Greene, NY. He graduated cum laude from S.U.N.Y. Geneseo with a B.A. in Drama and also from The Ringling Bros. Clown College with a B.F.A. (Bachelor of Fun Arts). Casey has worked professionally in theatre since 1985, going solo with **BubbleMania!** in 1990.

Casey's humor and skill appeal to every age. His talent has astonished audiences at schools, science centers, regional theaters and corporate events nationwide and around the world, including Japan, Mexico, Singapore, China and India. Casey was the first entertainer in history to put an audience member inside a giant soap bubble as part of a circus show. Presenting more than 350 live shows per year, Casey is one of the world's greatest and best known bubble experts. He has even taught bubble science to millions on both *The Discovery Channel* and *The Science Channel*.

Mr. Carle created his own award-winning art video on the wonder and beauty of bubbles, and also co-authored a "Teacher's Choice Award" hands-on science book, ***Bubbleology***, (no longer in print).

Mr. Carle has a home in the woods of East Haddam, CT with his wife, Kandie Carle, herself an accomplished performing artist. There is a bubbling brook in the back yard.

BUBBLE BASICS

Teachers: *You may choose to facilitate the following discussion with actual soap bubbles. However, please save student bubble-blowing until post-show activities.*

How many kinds of bubbles can you name? There are bubbles from bubble gum, bubbles in soda pop, bubbles in your tub and bubbles in the sink. But get this, balloons, basketballs and soccer balls are also bubbles.

What do they have in common? **They are all trapped gas.**

Soap bubbles are trapped gas, too. The gas is the same invisible air we breathe and that fills the room around us. What's trapping it? A thin skin or **film** of soapy water. This film holds the air in because liquids have an interesting property: **surface tension**.

SURFACE TENSION

If you've ever watched a leaf float on a puddle, you've experienced surface tension. **Surface tension** occurs because the **molecules on the surface of a liquid stick tightly to each other**, forming a kind of skin. When you dip your hand into a sink full of water, you're forcing some of the surface molecules apart, breaking the surface tension.

Have you ever tried dipping a bubble-blowing wand into plain water? What happened? The **water can't stretch across the hole in the wand, because its surface tension is too strong**—the "skin" of the water snaps back against itself. **Adding soap** to the water doesn't break the surface tension, but does weaken it. **Chemicals in the soap loosen the "grip"** the water molecules have on one another just enough that they will form a stretchy film.

What's the next step? **You blow air—a gas—against the soapy film.** The molecules have to move outward as the air presses against them, but surface tension still holds them together. If you get the air pressure just right, **surface tension will wrap that film all the way around that breath of air.** Congratulations! **You've got a bubble!**

POP! GOES THE BUBBLE

What happens if you poke your dry finger through a bubble? You guessed it.

Why do bubbles pop? Remember, surface tension is what makes bubbles possible. So what happens when you **break** that surface tension? Right. You've put a hole in the bubble wall and popped it!

Can you think of **other reasons** that might make a hole form on the surface of a bubble?

- The water evaporates
- Gravity pulls soap and water toward bottom
- The bubble touches a dry object (which absorbs water from the bubble)

ALL THE COLORS OF THE RAINBOW

If you look closely at a soap bubble or soap film, what do you see? Lots of **shimmering colors.** What causes them?

Just like a prism, soap film causes white **light to separate** into its component colors. Oil in a water puddle has the same effect. A **rainbow** is created in a similar way when water droplets in the air break up sunlight passing through them.

PRE- or POST-SHOW ACTIVITIES

BUBBLES ON PAPER (a “dry” activity)

Casey Carle makes sculptures out of bubbles. **What bubble sculptures would you make?** Would you “bubble-ize” your best friend? How about your favorite animal? What about a bubble dinosaur, or a bubble building?

Use your imagination! **Draw your fantasy bubble sculpture.** Use lots of colors to reflect the colors that move over the bubbles' surface. (Remember, real-life bubbles have some limitations—but your imagination doesn't, so anything goes!)

THE ULTIMATE BUBBLE-MAKER (a “dry” activity)

What kind of gizmos did Casey use to make his bubbles? What kind of bubble-makers have you used? Have you used something for making bubbles that was not meant for bubbling? Like a coat hanger? Or a cardboard tube? Or a bagel??

Imagine you are the world's greatest inventor--or magician! **What would be your Ultimate Bubble-Maker?** Would it be a machine? A volcano? Would it make the biggest bubble ever seen? Or the most bubbles ever created at one time?

Draw your Ultimate Bubble-Maker. Share your idea with your friends!

POST-SHOW ACTIVITIES

Teachers: *These bubble-making activities should be only be used after seeing **BubbleMania!** This will allow students to experience the full excitement of viewing bubble artistry and then returning to class eager to try it.*

EXPERIMENT WITH BUBBLES *Suggestions to Get You Started*

Teacher tip: *If you keep creations small and emphasize observation over recreation, most of your students' work will remain over a desk/table. If, however, you set no limitations on size and movement, be prepared for a mess! Either way, learning will be combined with fun.*

You will need:

- pipe cleaners
- individual pie pans OR group dish pans OR cake pans
- plastic drinking straws (refer to them as “bubble blowers” to remind the very young not to suck in)
- bubble solution (recipe below)
- newspaper or paper towels for the mess

Casey Carle's “secret” homemade solution:

- 1/2 gallon (64 ounces) **distilled** water (tap water is usually not as good)
- 1 tablespoon Glycerin (Available in pharmacies. Slows evaporation—not needed on muggy/humid days).
- 14-16 ounces Ultra Joy or Ultra Dawn (or 10-12 ounces non-ultra, good quality dish detergent). **Please Note:** When possible, search and use Non-Ultra Dawn and Joy products, or any name brand. non-ultra dish washing products.
- OPTIONAL: 16 ounces Commercial Bubble-Blowing Solution
- OPTIONAL: 2-4 more ounces dish detergent (but not more)
- OPTIONAL: 1 more tablespoon of Glycerin (but not more)

Mix well. Use a **clean** mixing bucket to avoid damaging chemicals. Keep in airtight container until ready to use. If outside, avoid **direct** sun and **dusty** or **dry** air. Wet, humid days are great bubble days. Long exposure to soap can damage grass. Avoid foam, which makes bubble-making more difficult. Keep **bar soaps** away from your hands and the solution.

Now try this...

Using only the “**bubble-blower**” (**straw**) make bubbles **just on the surface** of the solution in the dish or pan. Emphasize breath control and keeping surface free of foam. Try blowing **a**) one big bubble dome, **b**) a bubble inside the dome. Try sticking different size domes together until they look like a snow person, ladybug, flower, etc.

Bend the **pipe cleaner** to make a wand at one end. Wet the wand and while holding over dish use the straw to blow a bubble on the underside of the wand. Start with a plum-sized bubble and work up to tennis and softball size. Now use the straw to **create sculptures** in, on, over and under the bubble on the wand. Try some of the shapes and forms seen in *BubbleMania!*, or invent your own. Don't forget to give them names!

Words and Concepts

Bubble-ology	Bubble-ologist	Sphere/spherical	Surface Tension
Gas vs. Liquid	Evaporation	Energy	Gravity
Cube	Elasticity	Prism & Spectrum	Solution
Forces	Physics	Water Adhesion	H ₂ O
Soap Film	Humidity	Detergent vs. Soap	Formula

BUBBLIOGRAPHY (FOR FURTHER READING)

Find these titles online using a search engine:

K thru 2nd Grade:

- *Bubbles, Rainbows and Worms* by Sam Brown
- *Pop! A Book About Bubbles* by Kimberly Brubaker Bradley
- *Soap Bubbles: A Science Concept Book* by Seymour Simon

3rd thru 6th Grade:

- *Soap Science* by J. L. Bell

- *Tom Noddy's Bubble Magic* by Tom Noddy
- *Experiments with Bubbles* by Robert Gardner
- *Bubbles: A Children's Museum Activities Book* by Bernie Zubrowski
- *The Unbelievable Bubble Book* by John Cassidy
- *Bubble Festival: Bubble Activities in a Learning Station Format* from G.E.M.S., Lawrence hall of Science, Univ. of California at Berkeley

6th thru 8th Grade:

- *Soap Bubbles: Their Colors & the Forces Which Mold Them* by C.V. Boys
- *Demonstrating Science With Soap Films* by David Lovett
- *Universal Foam: From Cappuccino to the Cosmos* by Sidney Perkowitz
- *Bubble I: Bubble Activities in a Learning Station Format* from G.E.M.S., Lawrence hall of Science, Univ. of California at Berkeley

BUBBLE-LINKS

www.bubblemania.com – Casey Carle's official website. Photos, tips, science fair project suggestions, artistic and educational videos, public show schedule, & much more!

www.exploratorium.edu/ronh/bubbles/bubbles.html - San Francisco's Exploratorium bubble page – science for older students, plus lots of bubble links for all ages.

www.sdahq.org/new1198/kids/bubbles/ - The Soap and Detergent Association web page. Kid-friendly and fun.

STUDY GUIDE CREDITS

Learning Guide Author: Casey Carle

Learning Guide Editor/Contributor: Anne Stewart O'Donnell of The Discovery Theater, Smithsonian Institute, Washington, D. C.

Website Layout: Gary Torello, Quality Graphics & Marketing, Haddam, CT

Discovery Theatre Director: Roberta Gasbarre

www.DiscoveryTheater.org